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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/737,222	12/15/2003	David K. Biegelsen	D/A3598	7697

7590 09/07/2005

Patent Documentation Center
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EXAMINER	
DOUGHERTY, THOMAS M	
ART UNIT	**PAPER NUMBER**
2834	

DATE MAILED: 09/07/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/737,222	BIEGELSEN ET AL.	
	Examiner	Art Unit	
	Thomas M. Dougherty	2834	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *12/15/03*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-34* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) *1-3,6-14 and 16-34* is/are allowed.

6)☐ Claim(s) _____ is/are rejected.

7)☒ Claim(s) *4,5 and 15* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *15 December 2003* is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Drawings

The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the microprocessor, and other drive circuitry coupled to the first and second piezoelectric drivers as noted in claims 6-10 must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 6-10 and 22 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. The drawings don't show the circuitry therefore it is not completely clear how the invention is arranged.

There is no proper antecedent basis in the disclosure for citing "the interface" or "single plane" in claim 22.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 1-3, 13, 14, 16, 20-22, 25, 26 and 29-34 are rejected under 35 U.S.C. 102(b) as being anticipated by Mori et al. (US 4,613,782). Mori et al. show (fig. 6) a biaxial piezoelectric motor comprising: a contact element (60), the contact element (60) to include at least one point to contact an object (11) to be moved; a first piezoelectric driver (1) coupled to one side of the contact element (60), when energized, the first piezoelectric driver (1) to move the object in a first

direction; and, a second piezoelectric driver (2) to move the object in a second direction, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object in a two dimensional plane.

The contact element (60) is hemispherical in shape (at 10).

The first direction and the second direction are orthogonal.

The contact element (60) interacts with an opposite surface (fig. 5) to increase friction on the object (11) to be moved.

In their figure 5, Mori et al. show the opposite surface being a second biaxial piezoelectric motor.

A transfer element (10) is interposed between the contact element (60) and the object (11) to be moved.

The contact element (60) contacts the object (11) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As best understood, the interface between the piezoelectrics and the contact element is a single plane. Note that Mori et al. show in a variety of

figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

Mori et al. show (fig. 4) a biaxial piezoelectric motor comprising: a transfer element (26); a first contact element (not numbered) driven by a first piezoelectric (1, 3), the contact element coupled to a first point on the transfer element (26) to move the transfer element in a first direction; a second contact element (connected to any of the other 17) driven by a second piezoelectric, the second contact coupled to a second point on the transfer element (26) to move the transfer element in a second direction (note however that this is a goal of the invention which depends on how the device is driven), the first direction and the second direction form an angle other than 180 degrees. Note that the piezoelectric components are 120 degrees displaced from each other.

The direction of motion is rotational.

Mori et al. show a third contact element coupled to a third piezoelectric, the third contact element in combination with the third piezoelectric to enable movement of the object in every direction in a plane.

Mori et al. show (fig. 6) a biaxial motor comprising: a point of contact between the biaxial motor and an object (11) to be moved: a delivery mechanism (60) to deliver energy from a first piezoelectric (1) to the point of contact, the delivery mechanism including a first piezoelectric (1) to deliver energy to the point of contact in a first direction, the delivery mechanism (60) including a second piezoelectric (2) to deliver energy to the point of contact in a second direction, the first direction and the second direction to forma n angle other than

180 degrees to enable movement of the object (11) to be moved in a two dimensional plane.

The delivery mechanism further comprises: a contact element (60) coupled to the first piezoelectric (1) and the second piezoelectric (2).

The contact element (60) couples to an object (11) to be moved at the contact point.

The contact point is on a transfer element (10).

The transfer element (10) couples to the first piezoelectric (1) via a first contact element (63) and the transfer element (10) couples to the second piezoelectric (21) via a second contact element (67).

Claims 1-3, 13, 20-22, 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Matsuo et al. (US 2002/0038988 A1). Matsuo et al. show (fig. 1) a biaxial piezoelectric motor comprising: a contact element (200), the contact element (200) to include at least one point to contact an object (R) to be moved; a first piezoelectric driver (100) coupled to one side of the contact element (200), when energized, the first piezoelectric driver (100) to move the object in a first direction; and, a second piezoelectric driver (also 100) to move the object (R) in a second direction, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object (R) in a two dimensional plane.

The contact element (200) is hemispherical in shape.(10).

The first direction and the second direction are orthogonal.

The contact element (200) interacts with an opposite surface (surface of R is opposite to 200) to increase friction on the object (200) to be moved.

The contact element (200) contacts the object (R) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As best understood, the interface between the piezoelectrics and the contact element is a single plane. Note that Matsuo et al. show in a variety of figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

Matsuo et al. show (fig. 1) a biaxial motor comprising: a point of contact between the biaxial motor and an object (R) to be moved: a delivery mechanism (200) to deliver energy from a first piezoelectric (100) to the point of contact, the delivery mechanism including a first piezoelectric (100) to deliver energy to the point of contact in a first direction, the delivery mechanism (200) including a second piezoelectric (also 100) to deliver energy to the point of contact in a second direction, the first direction and the second direction to forma n angle

other than 180 degrees to enable movement of the object (R) to be moved in a two dimensional plane.

The delivery mechanism further comprises: a contact element (200) coupled to the first piezoelectric (100) and the second piezoelectric (100).

The contact element (200) couples to an object (R) to be moved at the contact point.

Claims 1-3, 6, 8, 10, 13, 16, 20-22, 30-32 are rejected under 35 U.S.C. 102(b) as being anticipated by Shibatani et al. (US 6,661,154). Shibatani et al. show (fig. 1) a biaxial piezoelectric motor comprising: a contact element (5), the contact element (5) to include at least one point to contact an object (10) to be moved; a first piezoelectric driver (2) coupled to one side of the contact element (5), when energized, the first piezoelectric driver (2) to move the object in a first direction; and, a second piezoelectric driver (3) to move the object in a second direction, the first direction and the second direction to form an angle other than 180 degrees to enable movement of the object in a two dimensional plane.

The contact element (5) is hemispherical in shape.

The first direction and the second direction are orthogonal.

Drive circuitry (see fig. 9) coupled to the first piezoelectric driver (2) and the second piezoelectric driver (3), the drive circuitry to determine a desired direction and amplitude of motion for the object, the drive circuitry including a processor (21) that computes the voltage amplitude (output of 19) applied to the first piezoelectric a (2) and the voltage amplitude (output of 20) applied to the

second piezoelectric (3) to move the object in the desired direction. Note that as these features are not shown in the figures, they are largely regarded as a goal of the invention which is not adequately supported by the disclosure including the figures, as noted above in the paragraph under the Drawings heading.

The ratio of voltage amplitude applied to the first piezoelectric driver (2) to the voltage amplitude applied to the second piezoelectric driver (3) is equal to the ratio of the cosine of the angle formed between the desired direction and the first direction and the cosine of the angle between the desired direction and the second direction. Note in figure 1 that the motion of the contact member (5) is circular, therefore each piezoelectric driver provides the same amplitude and drive frequency, as they are orthogonally positioned, it can be determined that the ratio is the same for each driver.

A sensor (current detector, 16, 17) determines the position of the object and provides feedback to the drive circuitry.

The contact element (5) interacts with an opposite surface to increase friction on the object (10) to be moved.

The contact element (5) contacts the object (10) to be moved at only one point.

Recitation of the output frequency or size of the contact element in relation to it is a method of operating or using the device. Obviously one could choose to drive the device with a frequency such that the wavelength is longer than the size of the contact element. It has been held that a recitation with respect to the manner in which a claimed apparatus is intended to be employed does not

differentiate the claimed apparatus from a prior art apparatus satisfying the claimed structural limitations. Ex parte Masham 2 USPQ2d 1647 (1987).

As best understood, the interface between the piezoelectrics and the contact element is a single plane. Note that Shibatani shows in a variety of figures the contact surface connected to either piezoelectric drive element on a single plane surface at the interfaces.

Shibatani shows (fig. 1) a biaxial motor comprising: a point of contact between the biaxial motor and an object (10) to be moved: a delivery mechanism (5) to deliver energy from a first piezoelectric (2) to the point of contact, the delivery mechanism including a first piezoelectric (2) to deliver energy to the point of contact in a first direction, the delivery mechanism (5) including a second piezoelectric (3) to deliver energy to the point of contact in a second direction, the first direction and the second direction to forma n angle other than 180 degrees to enable movement of the object (10) to be moved in a two dimensional plane.

The delivery mechanism further comprises: a contact element (5) coupled to the first piezoelectric (2) and the second piezoelectric (3).

The contact element (5) couples to an object (10) to be moved at the contact point.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which

said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 11, 12 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibatani (US 6,661,154) in view of Frey (US 5,598,051). Given the invention of Shibatani as noted above, he doesn't discuss the location of his circuitry on a PCB.

Frey teaches (fig. 3) piezoelectric elements (4A, 4B) where at least one is directly mounted on a PCB (6) which has conductive traces. Frey further notes that the conductive traces may be on a substrate which is insulative (col. 4, ll. 1-12).

It would have been obvious to one having ordinary skill in the art to use a ceramic PCB with appropriate traces for mounting the drive circuitry and piezoelectric and contact elements of Shibatani for its insulative properties as Frey teaches. Note that the choice of material for the PCB is a clear design choice based on designer preference. Note on page 7 of the disclosure that the applicants themselves say that "The PCB can be made of various materials such as fiber re-enforced epoxy, ceramics, and plastics."

Claims 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Shibatani (US 6,661,154)

Claims 17-19, 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shibatani (US 6,661,154) in view of Maeno et al. (US 6,404,104). Given the invention of Shibatani as noted above, he does not show a spherical contact member.

Maeno et al. show (e.g. fig. 13) a spherical contact surface (42).

Maeno et al. don't show two piezoelectric drivers connected to the contact member and don't note the material employed for the contact member.

It would have been obvious to one having ordinary skill in the art to employ the spherical contact surface of Maeno et al. in the device of Shibatani because such a shape would provide for a multi-degree of freedom of motion in the device as Maeno et al. note at col. 2, ll. 53-55.

Regarding the coating or the material of the contact member, it would have been obvious to one having ordinary skill in the art to employ a metal, plastic or ceramic contact member, including one that is coated with a thin layer, textured or not, in the combined device of Shibatani and Maeno et al. at the time the invention was made, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. In re Leshin, 125 USPQ 416. The applicants themselves note that the "contact element 104 may be made of a number of substances" at page 3, paragraph 17, line 1 of the disclosure.

Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mori et al. (US 4,613,782) in view of Maeno et al. (US 6,404,104). Given the invention of Mori et al. as noted above, Mori et al. do not show a spherical transfer element or first and second directions being orthogonal in their figure 4.

As noted Maeno et al. show a spherical member connected to their piezoelectric driver. Maeno et al. don't show two piezoelectric drivers per contact member or orthogonally disposed drivers.

It would have been obvious to one having ordinary skill in the art to employ a spherical transfer element in the device of Mori et al. at the time of their invention, as such a shape is shown by Maeno et al., in order to provide a device with an ability to move in multiple directions. It would have further been obvious to one of ordinary skill in the art to employ orthogonally spaced piezoelectric drivers in the device of Mori et al., about a transfer member, since this would involve mere duplication of the design and it has been hled that mere duplication of the essential working parts of a device involves only routine skill in the art. St. Regis Paper Co. v. Bemis Co., 193 USPQ 8.

Allowable Subject Matter

Claims 4, 5 and 15 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: the prior art fails to show third and fourth piezoelectric drivers coupled to a single contact element, in combination with two piezoelectric drivers connected to it at other than an angle of 180 degrees, which contact element subsequently drives a driven element. Regarding claim 15, the prior art fails to show on one side of a moveable member a piezoelectric driver, and on the opposite side, opposing the motor, a ball bearing.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Additional prior art cited reads on claimed aspects of the invention.

Claims 7 and 9 are so indefinite that art cannot be applied against them at this time. When they are made definite a consideration of their relationship to the prior art may be made.

Direct inquiry to Examiner Dougherty at (571) 272-2022.

tmd

tmd

September 2, 2005

TOM DOUGHERTY
PRIMARY EXAMINER